How our world works

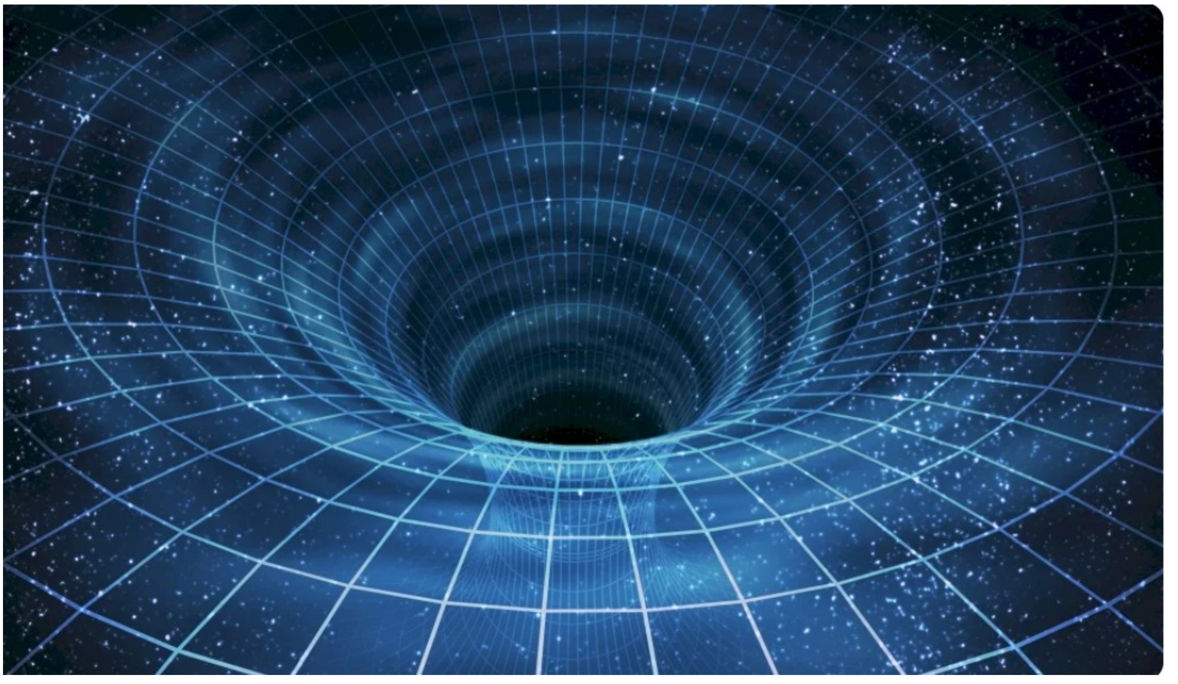
Part I

Black holes.

A black hole is a region of space-time with such a strong gravitational field that nothing, including light, can escape it. The boundary of this region is called the event horizon. In the simplest case of a spherically symmetric black hole, it is a sphere with a Schwarzschild radius, which is considered to be the characteristic size of a black hole.

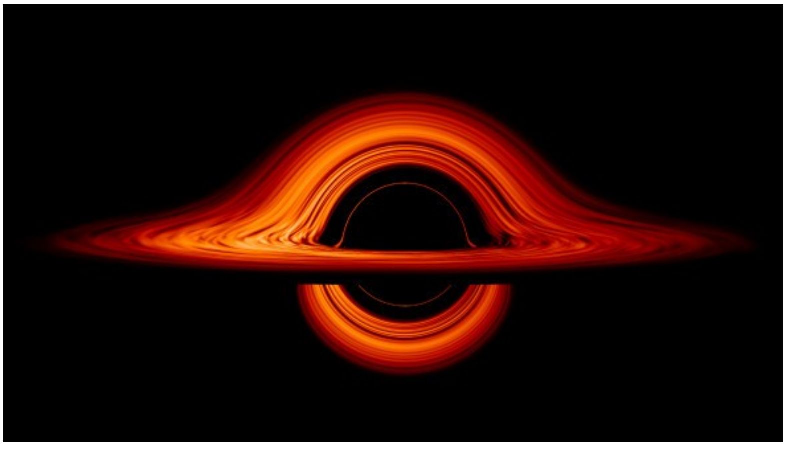
Modern scientists agree that black holes do not have one clear definition, and even the above is one of the options. If you ask different scientists - astrophysicists and physicists - they will approach the answer from different angles. The general summary of all definitions and formulations is something like this: mass has turned space and time. Black holes are the most compact object that does not exhibit surface properties. An imaginary event horizon is determined, which is a conditional boundary between a black hole and the space surrounding it. The event horizon is the "region of no return" or the boundary of a black hole. The property of “non-exposing the surface” has a deep meaning and can lead to a more complete understanding of the evolution of a black hole. In the Schwarzschild solution describing the behavior of a black hole, it is noted that despite the presence of the Schwarzschild radius included in the solution, the concept of a center point does not exist.

To study black holes, we will resort to the help of ultrametric space. A hint that we need this type of space can be the remark about the center mentioned above. In ultrametric space, any point inside a circle is its center. There is no center that we understand (in ordinary space in an ordinary circle) for the inner region of the solution of a black hole, which is rightly indicated in the equations of the Schwarzschild solution.

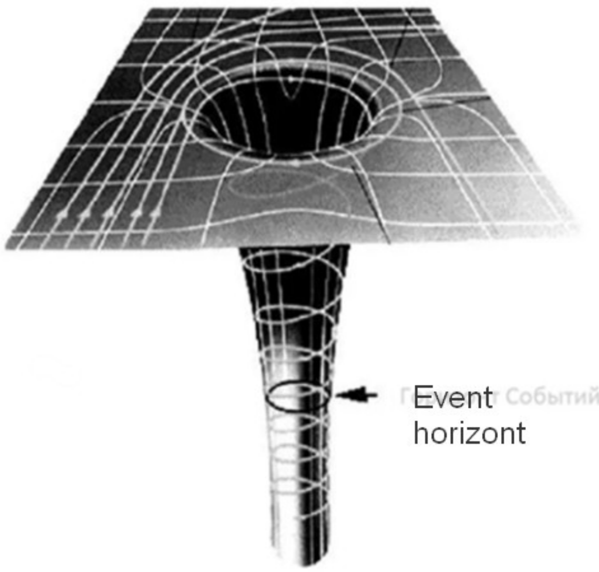


Field lines characterize the curvature of space near a black hole, in the language of mathematics - the metric of this space. A metric is a set of values that can be used to calculate the distances between the corresponding bodies, as well as their other metric properties (areas, volumes, etc.). These values in the calculations take into account the curvature of space.

The flow of particles moves along the lines of force (geodesic lines) formed as a result of the curvature of space-time. The lines of force, their shape and behavior show that the curvature of space near a black hole is quite large. The geometry of this region of space essentially depends on the mass of the black hole and some additional parameters. The fall of photons and other particles into a black hole does not occur uniformly in a spiral, but in a “rosette”. In any case, tidal forces are uneven and capable of bending the lines of the gravitational field in a bizarre way, which will lead to significant degradation of space.



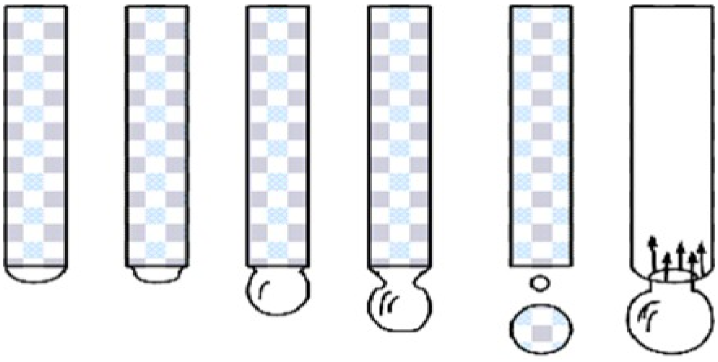
Stages of black hole evolution in the process of degradation:



However, the curvature of space and, accordingly, the metrics near massive black holes become essentially non-linear in the course of evolution, and at a certain moment there is a rapid decrease in the radius of the event horizon. The process of further evolution of a black hole can be represented in a figurative form:

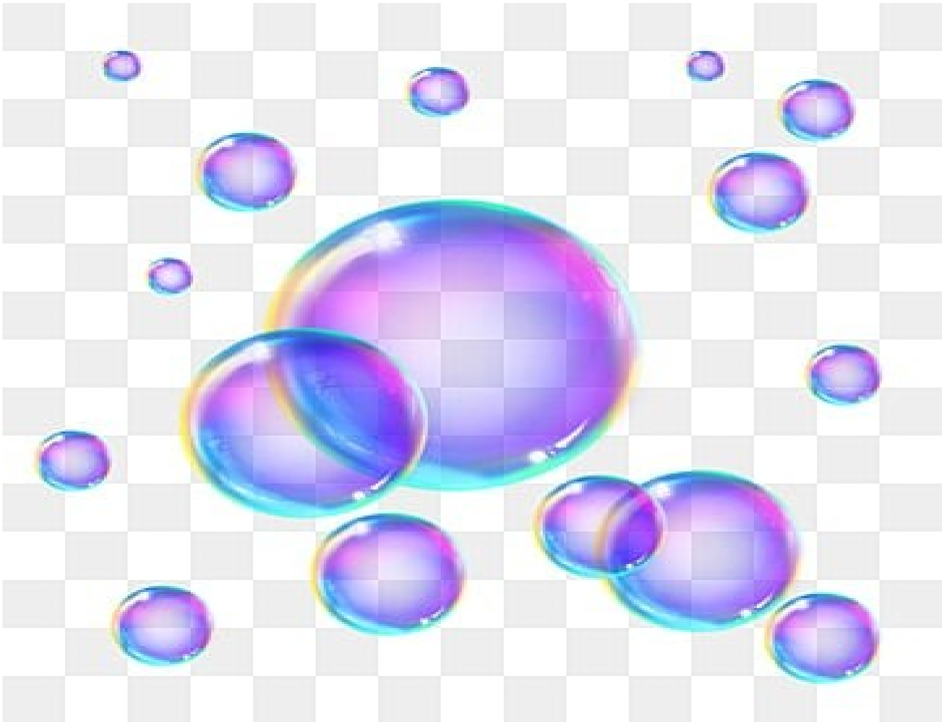
In other words, from a certain moment the radius of the event horizon begins to rapidly decrease and the black hole first sags on a “thin handle”, and then completely collapses. From this moment on, it ceases to border on the surrounding space in terms of our geometry and forms a kind of gap (a detached drop), with its own metric and the corresponding geometry of the internal space.

The moment of formation of a gap will most likely be accompanied by the release of a certain amount of energy (jets), some other portion of energy can accumulate and support the deformation of space due to the formed internal feature (defect).



The observation of the collapse of massive black holes is unlikely, since the huge gravity significantly slows down time at the event horizon (relative to the Earth observer) and it can be expected that a massive black hole, according to Hawking, slowly evaporating and decreasing in size, will mix with the ocean of quantum microscopic black holes in “planck" scale.

However, in the microcosm the energies are much weaker and the process of folding microscopic quantum black holes proceeds rapidly and constantly.



Lacunas from "collapse"

Consider the result of folding in a different way: the gap (or space defect) is important only from the point of view of our space, and from the point of view of space in that it turns out, this area is a kind of “hemisphere with a leg”.

Lacunas are areas of double space. The introduction of double space can be a decisive step in building a theory of both quantum gravity and a different picture of the world. Using the suggestions above, a candidate in a double space can be an ultrametric space with a non-Archimedean metric (the absence of a center at the radius of a black hole, the presence of isolation of boundaries for different environments of equal diameter, etc.).

Despite the fact that gaps are inclusions and do not have "spatial" boundaries with the surrounding space, nevertheless, in the application of energy-structural (gravitational interaction) and influence on the physical properties of our world. The energy that appears as a result of the transformation of "material" particles in a black convolution, a hole and deformation features of space can serve as a prototype of dark and dark matter, which is so accurately sought in modern cosmological models.

Considering the options for the formation of a gap, an analogy in the form of a yeast dough involuntarily suggests itself. In our microcosm there are constantly "bubbles" of folded microscopic black holes, which literally inflate the fabric of our space. Manifestation of the well-known Hubble shift, which is considered to be a consequence of the recession of the Galaxy. In our case, the folding of myriads visually implements this process, forming defects in every small volume of our space.

This model is remarkable in that it eliminates some of the paradoxes associated with the unusual understanding of the expansion of the Universe, such as the Hubble-Lemaitre stress, large-scale anisotropy of the Universe, etc. The development of this approach implies the emergence of alternative theories to the Big Bang, since the expansion of the Universe reveals it without involving it. In addition, it becomes tangible why the expansion of fiber space with acceleration. The collapse of quantum black holes occurs constantly, including in the already "expanded" part of space, so the expansion can be described by a differential equation with the outcome in the form

$y = A \exp(kx)$;

significant exponential, non-linear growth.

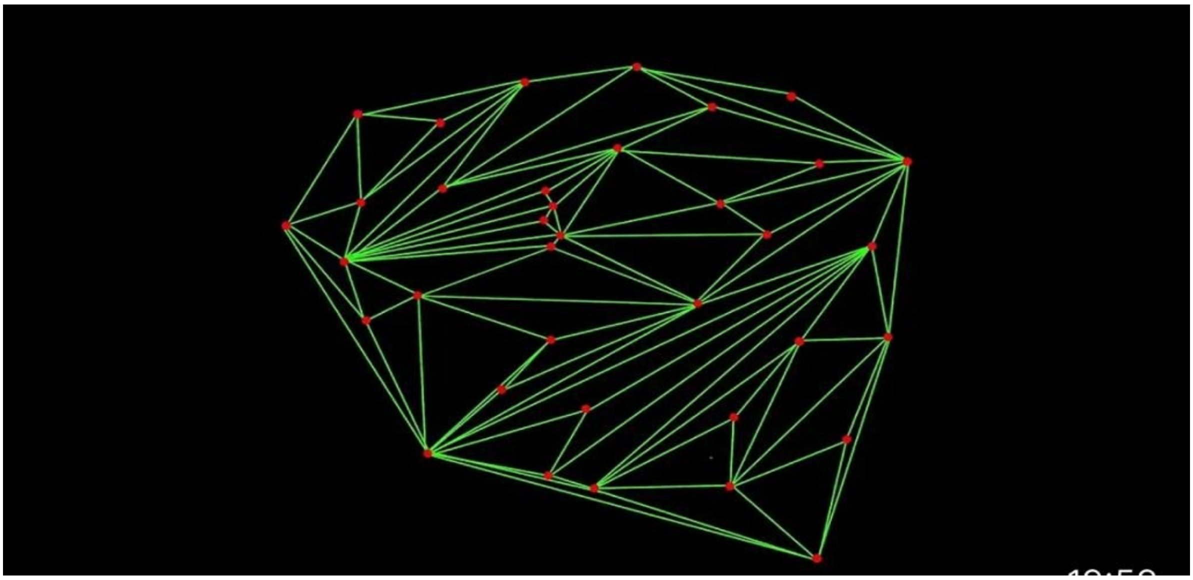
It is not difficult to calculate the number of hourly microscopic black holes that form in space in order to compare it with the experimentally obtained rate of penetration of the Universe and most accurately determine the type and number of particles that lead to the formation and collapse of mini

black holes (the measured speed of the connection of the Universe is 81,100 kilometers per hour). million light years).

Extended space model.

The modern description of the Universe, in particular its expansion, follows from the Big Bang theory. The Big Bang itself occurred for what could be an explanation for the expansion of the universe. The second oddity of the modern idea: why the expansion of space occurs without "consequences". How can one accept that some substance "expands" without changing its properties? This uncomfortable question is rarely raised in modern physics.

However, there are several approaches to describing our space and its geometry. One of the most promising is the theory of loop quantum gravity, in which our space is identified with the gravitational field. This story is a space from its own back network, which connects nodes - gravitons.



An important feature and advantage of this theory is that the graviton and the spin lines adjacent to it are not located in space - they are quanta of the space itself.

The disadvantage of this theory is the introduction of time t into the quantum interval (the history of the spin network), although the limitations lying on the surface, discovered by theoretical physics:

Physical quantity	**Physical constant**	**Theory**	**Discovery**
Velocity	c	Special relativity	Existence minimum speed

Information (action)	$\hbar$	Quantum mechanics	Existence of a minimum piece of information
Length	L_p	Quantum gravity	Existence minimum length

suggest natural parameters on the basis of which the theory of quantum gravity should be built.

The approach of string theory in describing the picture of our world is somewhat different. String theory introduces the concept of one-dimensional extended objects whose vibrations can describe the elementary objects of the Standard Model of the Universe. Following this theory, instead of a graviton, the existence of a “one-dimensional” object is postulated, twisted in a special way in 11 (in some versions, 10) dimensions in the smallest volume of space. Unfortunately, in addition to the mathematical description of these objects, called Callaby-Yau manifolds, there is no single integral idea of the geometry of the space of our world within the framework of this theory.

Part II

Our everywhere “full of holes” world.

Our space is defined by gravitational fields. To put it simply, material objects form gravitational fields around them, superpositions of these fields form an arena (area) in which Galaxies live and where the physical Laws of our World begin to work. These formations and laws exist in macroscopic volumes and sizes, and to describe them with the help of models, we use spaces with the usual Archimedean metrics (General Theory of Relativity). In the microcosm, on the “Planckian” scale, our world begins to come into contact with the ultrametric space, with which it is thoroughly permeated. In the microcosm, a monolithic, integral space with a continuous metric and sufficiently smooth (regular) laws degrades. The lines of force that form the framework - the structure of space, begin to mercilessly deform, tear, twist into endless spirals, or cycles, like strange attractors. Energy flows (processes that are dual to the collapse of a quantum microscopic black hole in the microcosm) begin to burst into our space, realizing in the form of virtual particles that are supplied by ultrametric space. When considering the “Planck” scales, the ability to “work” with both small areas of space as a whole and with micro-objects of similar sizes is lost due to invariability (there is no time) and uncertainty (there are no properties of the usual space that allow fixing the coordinates of this object). On these scales, the Heisenberg uncertainty principle works. Usually this principle is explained by the fact that the intervention of the measuring device significantly affects the measured process itself, therefore it is impossible to simultaneously find out the coordinates of elementary particles and their speeds (more precisely, impulses). The point is not in the accuracy and roughness of measuring instruments, as they say now. Metrics and the meaning of the measured parameters are lost. Regions of space turn into networks with gravitons as nodes and connecting gravitational field lines. The presence of fractional-dimensional "voids" in this network does not make it possible to

accurately localize the coordinates and velocities of particles. What is more significantly changing the geometry of space. Our whole space is dotted with holes-areas, our world is discontinuous everywhere in each of its “Planck” areas. Figuratively, this picture appears as a boundary layer that separates the space of our world with an Archimedean metric and the ultrametric space with a non-Archimedean metric. Transitional interactions in this boundary layer are quantum foam, predicted and described in modern models of the microworld. Geometrically, this layer is a complex fractal space with fractional dimensions that change in each minimal volume of this space. "Planckian" scales are areas of microscopic quantum black holes, spin networks with gravitons at the nodes, and anti-black holes, which characterize the processes taking place in the ultrametric space and manifest in the birth of virtual particles in our world.

A) On scales greater than the "Planckian", the superposition of many gravitational fields become fairly regular, stable and smooth, which ensures the existence of stable macrostructures and their evolutionary development.

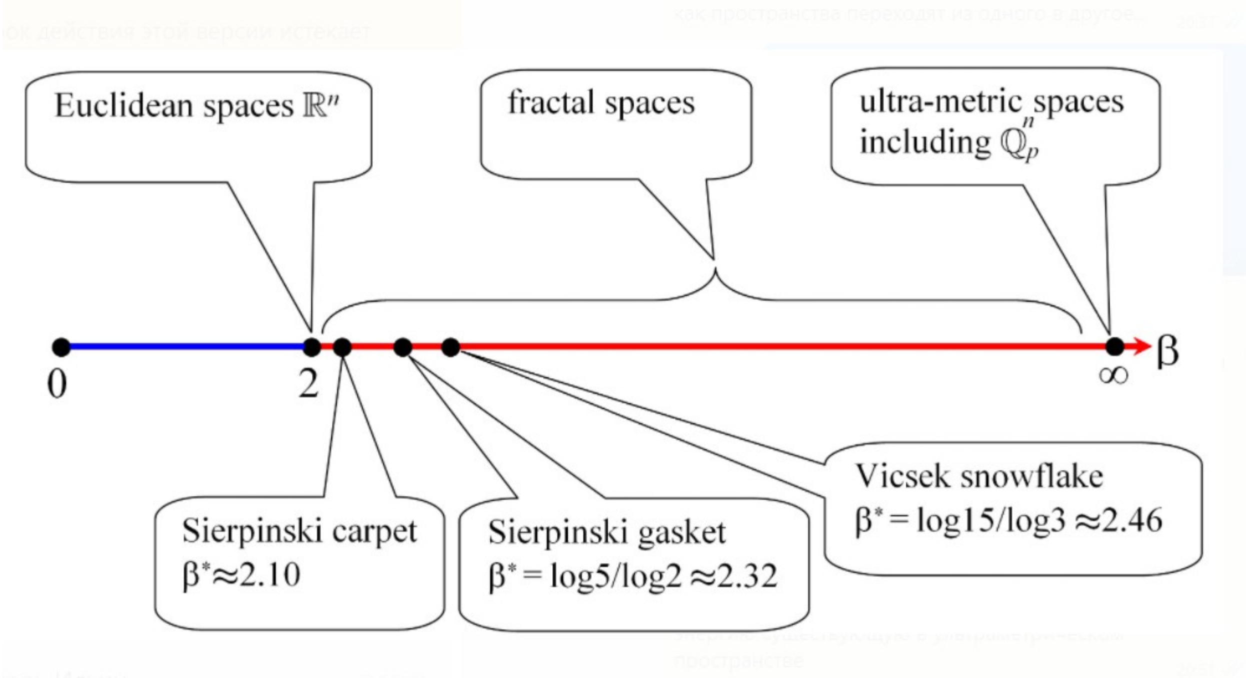
Our macrocosm is gravitational fields, and the space they form is the space with the Archimedean metric.

B) A network with holes between gravitons is the boundary areas between gravitational fields and ultrametric space, and mathematical calculations show that fractal spaces serve as these areas (Sierpinski carpet, Sierpinski cemetery, Vishek snowflake, etc.).

Fractal spaces leave their traces in the form of fractal sets in ultrametric spaces and in the form of perturbations of gravitational waves and "defects" of the gravitational field in the macrocosm.

C) The ultrametric space is an arena of quantum interactions, which in fact is a generalization of the Dirac vacuum.

You can clearly demonstrate the picture of this model as follows: the metric characterizing the geometry of space is a variable. The metric depends on the dimensions of the areas to which it is applied, and as these dimensions change, it evolves:



where the value of β is inversely proportional to the diameter of the considered region of space.

The principle of conservation of information, which was considered lost during the capture by a black hole and the subsequent evaporation of the latter, is implemented as follows. A black hole is described by a fractal dimension on the scale shown, so the information captured by it is approximated as a set of numbers βi =log n/ log m located on the indicated scale and data supplied by the fractal itself and the fractal archiving process.

The proposed model contains all three components from the table above:

1.Speed. This is the first term of the Laplace equation, which we use to describe the probabilistic processes of black hole collapse, to construct the above scale of metric change, and to calculate the decreasing density of the expanding Universe (using the distribution density of the corresponding jump kernel):

V − Δu = 0, (where V=∂u/∂t),

2. Planck length - the diameter of the region, characterizing the fractal space

$$\ell_P = \sqrt{\frac{\hbar G}{c^3}}$$

ℓ_P = Planck length

$\hbar$ = reduced Planck constant

G = gravitational constant

c = speed of light in a vacuum

3. Information quantum β (information that fell into a black hole is approximated by the set { $\beta 1$, $\beta 2$,….}, where $\beta i = \log n / \log m$ are points of the metric scale. (according to Shannon, information is expressed in terms of logarithms)

Analogies giving an idea of the model.

Let us give two analogies to understand the presented model.

1. Imagine a fishing net, which blocked the river. The main flow of water passes through the cells of the network, but some of it interacts with the loops of the network, causing the network to vibrate, stretch or shrink. In exactly the same way, on the Planck scale, the spin network vibrates from interactions with ultrametric space as an energy burst, which manifests itself in the creation of virtual particles. The deformation of space generated by microscopic black holes in the opposite direction, in turn, interact with ultrametric space, which acts as a "flow" of the river.

2. The flow of water is in motion (for example, in a pool). Rays of light penetrating the thickness of the stream form a play of shadows on the bottom of the pool in the form of spots.

The spots change shape, diverge, on the contrary, merge depending on the shape of the waves on the surface of the stream as a whole, resembling a picture of fluctuation foam. On the other hand, rocks lying on the bottom of the pool can form stable configurations in the form of standing waves on the surface of the stream (the stream flows over the rock at the bottom, forming a stable bump). The example demonstrates the main elements of the model. The surface of the flow acts as an analogue of the gravitational space with all sorts of deformations and waves, forming whirlwinds in the form of crows, collecting floating debris (Galaxies) in them. The thickness of the stream is a boundary fractal space that allows transferring interactions both from the surface of the stream to the bottom of the pool (the play of shadows on the bottom) and in the opposite direction (the influence of stones on the shape of the surface waves). The bottom of the pool in this example is an analogue of the ultrametric space, and the geometries and methods of transferring interactions are different for each of the three "spaces".

Part 3

Inflationary processes in the stage of development of the Universe.

The modern theory of the inflationary universe (and there are not so few of them) appeared to explain the solution of problems in the Big Bang theory:

• the problem of homogeneity, or why the General Extreme Surprise just after the big bang;

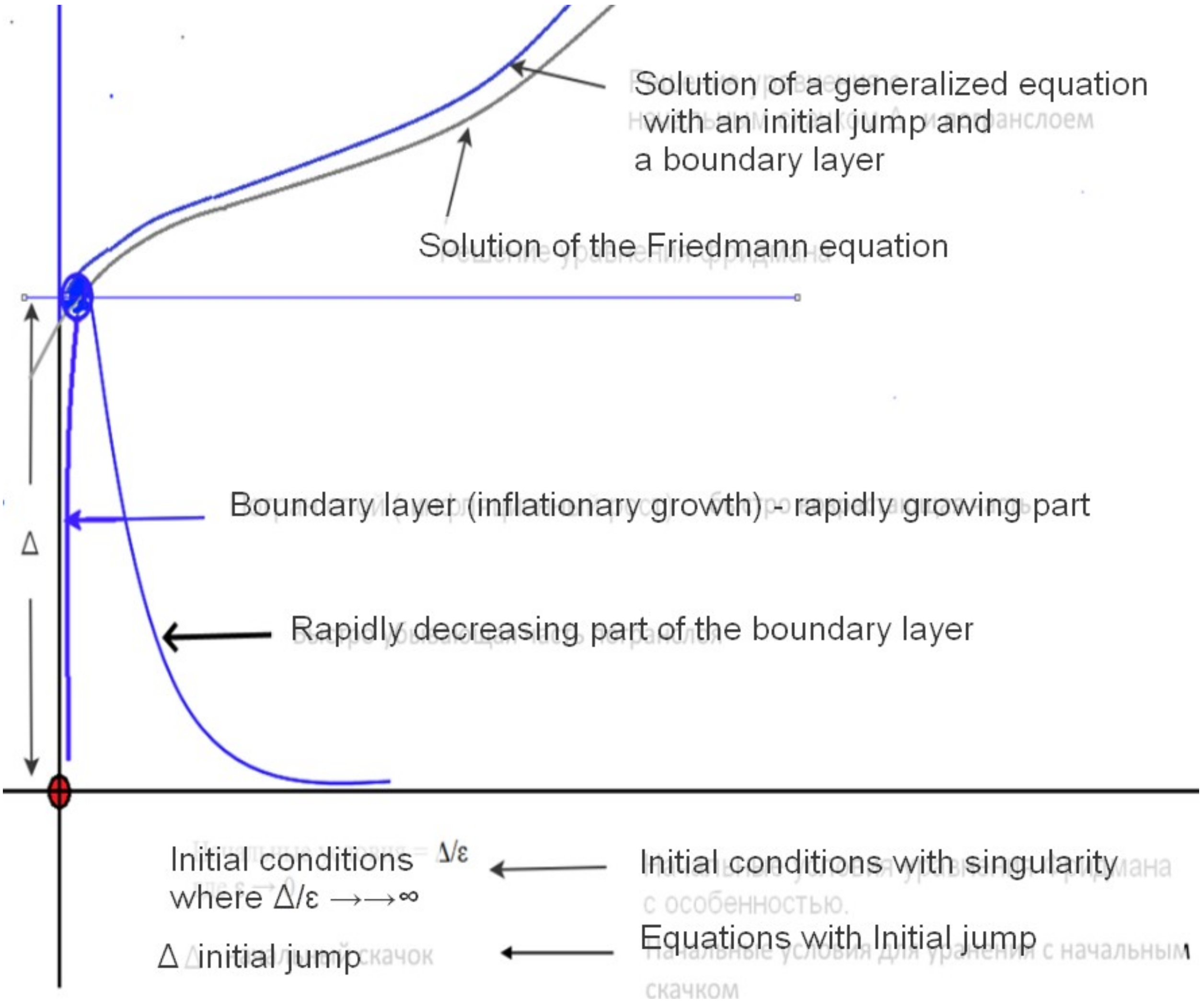
• flatness problem;

• predicted overproduction of magnetic monopoles.

The theories are quite far advanced, but each is based on the idea of a very rapid expansion of the Universe in the initial stage of its origin. This extension closes the problems of homogeneity and isotropy, allergic reactions at the present time and inadequate treatment in the framework of the big bang theory. However, the theories themselves have a number of shortcomings and internal problems. In addition, the basis for primary reasoning and initial postulates are simplified ones.

(For example, modern theory proposes in the presentation of A. Linde and K. is based on the following argument. The scientist operates with a calculation algorithm, but his initial postulate, roughly speaking, is inadequate. Comprehensive expands, but that all its content relies. has it changed inside?" - Nothing. about everyone is arbitrary: anything follows from the false.)

No one argues that the inflationary model is of interest in the sense that it involves the choice of the situation of the development of the Universe, but the prerequisites and postulates must be different. Simplified, the inflationary model can be quite simply obtained from the Friedman equation by modifying it with a correction in the form of the highest derivative with a small parameter. Then the solution of the problem will give an exponential growth in the boundary consideration (in the initial period, or other phrases in the initial moment of time)). In what follows, it will asymptotically tend to the solution of the usual Friedmann equation. Interestingly, the predisposing expanding Friedmann equation in the form of an asymptotic expansion of the boundary layer and the stationary part and measured by the initial state can approximate the stationary part quite accurately to the Friedmann equation. Extended detection shows the presence of the connection of the initial state, the appearance of the initial jump and the boundary layer accompanying the inflationary stage of the Expansion of the Universe.



As you know, the Friedmann equation appears from the Einstein equations and indicates the expansion of the Universe at certain parametric values. phenomena cease to play a decisive role .. But only until the next stage, when the effects of quantum black holes begin to affect. It is possible to describe the physical components of the inflationary stage in one way or another, but they will be described by the above equation.

In fact, this technique makes it possible to build cosmological models of the Universe, removing all the effects of the Big Bang from the field of consideration, including the initial singularity, limiting itself to the inflationary stage (solution with an initial jump Δ), the exit stage from the boundary layer, and the stage of further expansion. As for the stages of the Big Bang and evolutions of black holes (including quantum ones), they must be described by equations with ultra-measures in the corresponding ultrametric spaces. Examples of such equations in p-addic spaces were considered by Vladimirov and his followers.

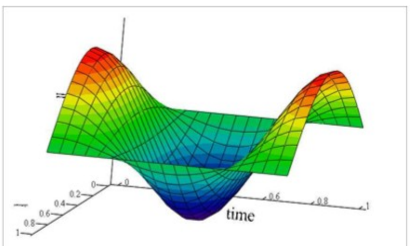
Breaking out of quantum dimensions, the Universe began to exist within the framework of various forms of Einstein's equations, in terms of the

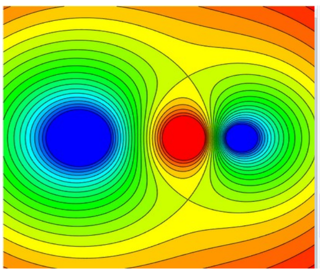
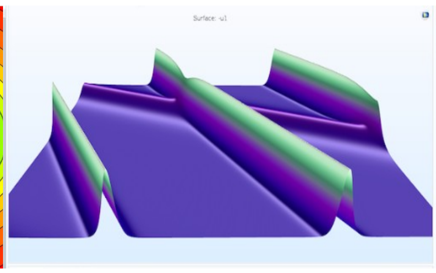
geometry of curved space, and therefore in terms of Archimedean metrics that describe these curvatures. This conclusion carries the following conclusion - in quantum dimensions (where the theory of general relativity does not work), a completely different metric should be used, as we talked about above.

The phenomena of the Big Bang itself and also the phenomena of the evolution of black holes no longer belong to the geometry of our space, but to spaces with a non-Archimedean metric and to fractal spaces.

Nevertheless, let us return to the postulate of the inflation theory. He argues that in a space that expands (in the same inflationary stage) nothing changes. However, it seems to us that the structure of space is fundamentally changing. Dark matter appears in it to an excessive extent, manifesting itself in the form of permanent defects in space itself as a result of super curvature during the collapse of quantum black holes. The inflationary process itself and the formation of huge volumes of space (expansion) comes from a huge amount of energy from the Big Bang (outbursts of energy flows from ultrametric space) and partly from the collapse of black holes, including quantum ones. The formation of matter in one form or another generates our space around itself (gravitational fields). In the stage of inflation, the processes of formation of material objects that accompany the appearance of huge volumes of space prevail, however, as inflation stops, the appearance of new volumes stops, and the Universe passes into the stage of stationary expansion, which depends only on the total number of “collapses” of quantum black holes.

The inflationary stage is the stage of gravitational super-storms. Giant tsunamis, appearing from the accelerated birth of gravitational fields, begin to walk throughout space. Considering these waves within the framework of hyperbolic equations, we will inevitably come to catastrophes (peculiarities according to Petrovsky), which will form huge eddy of various types. In the vicinity of these vortex conglomerates, dark matter and clouds of interstellar gas, dust , interstellar electromagnetic fields, and cosmic rays will accumulate.



The further process has already been described by modern science: clots of dark matter begin to accumulate and hold giant molecular clouds near them

and start the process of star formation. In the future, the same dark matter keeps the formed galaxies from rapid decay. In great evidence is the fact that the shape and size of the Galaxies correlate with the types of features that create gravitational waves in gravitational fields.

In contrast to catastrophes of a local nature, the simplest catastrophes called folds are of particular interest (last figure)

The presence of such formations with the corresponding drift is predicted by almost all cosmological models and is called cosmic strings.

Conclusion.

Let us present some consequences that may follow from the model proposed above.

1. Corpuscular-wave dualism.

Explanations for the existence of particle-wave objects are mostly based on the quantum principle of superposition, when, during particle-wave interactions, it leaves the state of superposition, realizing a suitable state for this interaction. Typically, this state is obtained from the wave function (wave properties) and from irreducible representations of the Lorentz group by localizing the wave energy into local coordinates (corpuscular properties).

From the point of view of the model proposed above, the particle-wave exhibits wave properties outside the vicinity of microscopic black holes and the properties of particles when the wave packet completely covers the region of the microscopic black hole at the moment of interaction.

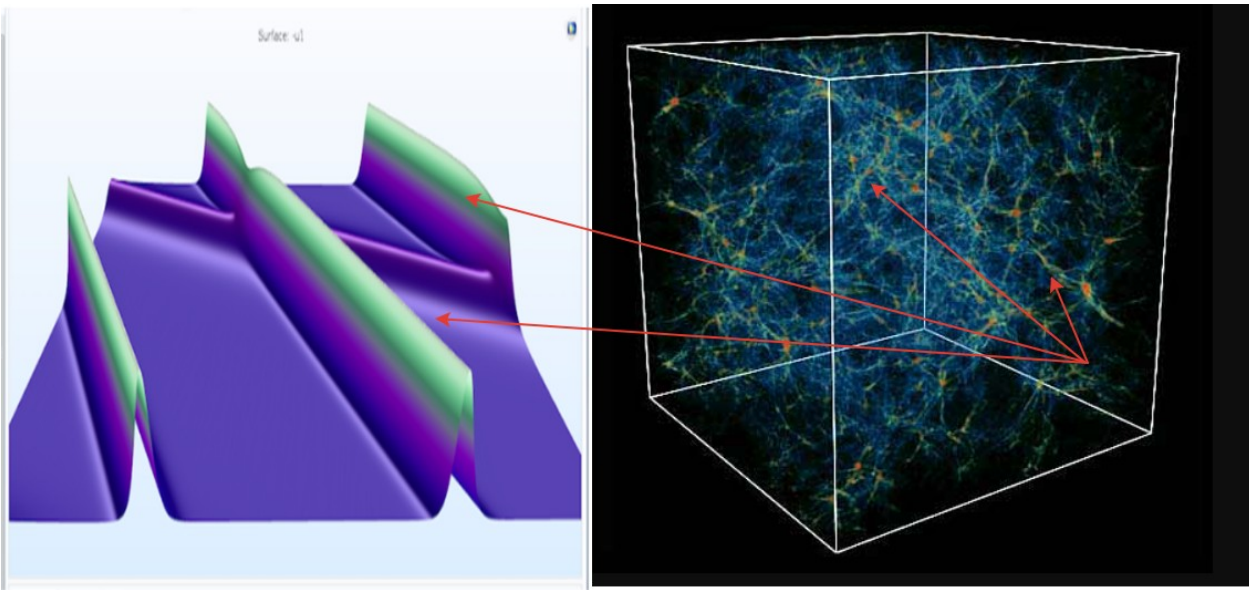
2. Expansion of the Universe.

The expansion of the universe is explained by the collapse of microscopic black holes and the deformation (swelling) of the fabric of space. The presence of internal features in the form of microscopic black holes and deformation features after their collapse does not allow the tissue space to return to its original state. The energy of collapse and the resulting deformations of the fabric of space determine, respectively, dark energy and dark matter.

3. Entanglement of particles.

If the trace from the gap - inclusions (thin bridge) does not have time to isolate itself from our space, then it continues to have a connection with the dual space. This phenomenon could explain the effect of entanglement of particles, when the “bridge” keeps the gap from collapsing in our space, but loses its spatiotemporal attributes itself, being immersed in ultrametric space. Entanglement is explained by the presence of the same “bridge” for

entangled particles. The length of the jumper (and the speed of information transfer between particles) is small, since it is measured by ultrametrics and changes according to other formulas with increasing distance between particles in the macrocosm.



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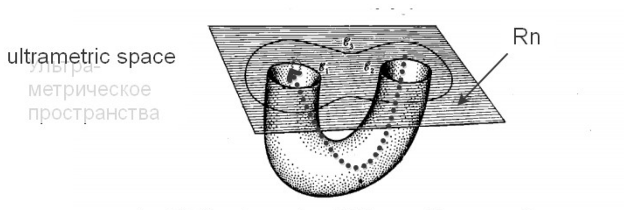
Two entangled particles bound in ultrametric space
ручкой, находящейся в ультраметрическом пространстве



"Nonlocality" between entangled particles is tacitly recognized by all the leading physicists of the world, but there is still no clear explanation for this phenomenon. , secondly, to determine the speed of information transfer between them. Sometimes increasing distance, and seeming "instantaneous" transmission. To be honest, no one requires instantaneity, it is required that after interacting with one, the second “learns” the result before an external observer begins to interact with it. "Instantaneous" is screwed so that the particles separated over a huge distance will FAST exchange information.

The distance problem is solved by changing the metric (the geometry of the space in which the signals between the entangled particles propagate) and the transmission rate itself, which can be instantaneous or almost instantaneous if time is excluded or significantly changed in this “transport” space. Wormhole ideas seem to meet these requirements at first glance. But where does the energy come from to create and maintain the hole, why the

speed and time of the signal passing through it change from the point of view of an outside observer, given that the particle is waiting for the signal from this observer. The speed of light is absolute and maximum, when transmitting information using massless particles, nothing can be done about it. You can get the effect of time acceleration for an outside observer (and an entangled particle) by making the first particle move at a high speed, which is not the case in experiments, because according to general relativity, an outside observer in the form of a receiver particle must move very quickly, and therefore the transmitted side is slow. It turns out - a contradiction. That is, GR cannot cope with both distance and causality. Curve space just around the wormhole tunnel to bring the entangled particles closer? It seems that no self-respecting space can withstand this and “tear”. He, poor thing, was already loaded with the most accelerated expansion. The way out is seen in the use of the transport medium in the form of an ultrametric space: there and with distances everything is different from ours (literally, the distance to far points is not at all “further” than to the nearest ones) and there is no time familiar to us. As for causality, due to the absence of "materiality" in this space, one can forget about the transfer of information about certain "secrets" of the history of material interactions. Here is locality, so locality - a local property is transferred, there is no step to the left, there is no step to the right, since inside this space the concept of locality is different than in ours. Although, in my opinion, the concept of causality is not wedged in any way here, everything is just a tribute of modern physicists to the space-time cone, to the concept of time and wave function.

4. The impossibility of creating a Unified Field Theory in a closed form.

The creation of the Unified Field Theory is the construction of a model that connects the equations of quantum physics and general relativity into a single system of equations with solutions without singularities at any scale.

The main technique in solving this problem is the idea of constructing solutions of both models in such a way that, when obtaining a general solution, the infinities arising on the transitional scale from the solutions of the GR equations and from the solutions of the equations of quantum physics compensate each other.

Ascending theories (where solutions are built from combinations of solutions in the small with subsequent corrections as the scale increases) and opposite descending theories are also considered.

This model predicts the practical impossibility of solutions in such ways, since when coordinating the joint solution of quantum physics and general

relativity, it is necessary to take into account the continuation of this solution in a fractal space of fractionally variable dimension.

5. The information captured by the black hole can be restored by fractal traces on the metric scale from the corresponding fractals.

Addition.

Time.

Time is unidirectional. The passage of time cannot be turned back. This strange component is present in the space-time continuum. Time differs sharply from the other three spatial components in its properties. Time can slow down or speed up in the General Theory of Relativity, which is proved by experimental data. Time can practically stop near the event horizon of massive black holes. However, turning to the essence of the issue, we can see that we simply measure the speed of certain processes. For a person, time is the speed of his chemical reactions, the speed of interaction of chemical processes, the degradation of these processes, leading to old age. In the quantum world, time is the rate at which quantum fields interact. Simplified, this is the counter of these interactions. As evidenced by the Wheeler-De'Witt equation, the fundamental equations do not contain a time variable.

Time is a convenient abstraction invented by man for generalizing the speeds of millions of different interactions and characterizing these interactions with one parameter. It is convenient for us to imagine that there is a single time that underlies every movement or process.

However, the existence of time is merely a convenient assumption, not the result of observations. Newton, introducing Abstract space and Abstract time in his writings, wrote that it is impossible to measure "Abstract time" t, but if we assume that it exists, we get a convenient and effective construction for describing nature. Thus, our ordinary sense of time is only an approximation, an abstraction that works well in the macrocosm. There are elementary processes in the microcosm in which the quanta of space and matter (or energy) continuously interact with each other at certain speeds, and time is not needed to describe these interactions.

In the quantum world, time must be quantized, demonstrate probabilistic uncertainty, have its own quanta-portions. These attitudes bring noticeable discomfort and discord into the existing picture of the world and the models that describe it.

Replacing the abstract concept of time with the speed of interaction, one can arrive at more successful designs. For example, quantum events on the Planck scale are no longer ordered by the course of time, changes in quantum fields occur and they are characterized by the speed of their flow when they interact with each other. In quantum physics, the "non-existence" of habitual time and ordinary space is simply a characteristic of quantum interaction.

Let's add that speed has "temporal" properties, such as unidirectionality and quantum indeterminacy. The speed of interactions can change, increase or decrease. The time expressed through it also acquires these properties, removing the logical discomfort in the GR formulas that postulate a slowdown or acceleration of relative time. So, in models of the world, one of the main parameters is speed, and time is its convenient, but abstract counterpart.

Oleg I. 2022